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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/701,183

11/04/2003

Hylke Akkerman

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09/01/2006

THE ECLIPSE GROUP
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EXAMINER

NGUYEN, THANH T

ART UNIT

PAPER NUMBER

2813

DATE MAILED: 09/01/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/701,183	Applicant(s) AKKERMAN ET AL.	
	Examiner Thanh T. Nguyen	Art Unit 2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 July 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3, 5-13, 19 and 21-27 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3, 5-13, 19 and 21-27 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>7/10/06</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Request for Continued Examination

The request filed on 7/10/06 for a Request for Continued Examination (RCE) under 37 CFR 1.114 is acceptable and an RCE has been established. An action on the RCE follows.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-3, 7-8, 10-11, 19 are rejected under 35 U.S.C. 102(b) as being anticipated by Katz (U.S. Patent No. 6,403,397).

Referring to figures 1-2, Katz teaches an integrated circuit, comprising:
a dielectric layer (14) comprising a surface, a portion of said surface having exposed aromatic groups (polyimide is aromatic polymer, see col. 3, lines 15-19), the dielectric layer being formed from a precursor composition having a refractive index of at least about 1.52 (noted that polyimide has a refractive index of greater than 1.52. With regard to the term “dielectric layer being formed from a precursor composition” is method recitations in a device claimed, and they are non-limiting, because only the final product is relevant, not the method of making. A

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product by process claim is directed to the product per se, no matter how actually made. See also MPEP 2113. Moreover, an old or obvious product produced by a new method is not a patentable product, whether claimed in “product by process” claims or not. It is also noted that polyimide is formed from organic precursor”.

a polycrystalline semiconductor layer (16) comprising an organic semiconductor composition overlying and in contact with the portion of said surface, the organic semiconductor composition comprising a compound comprising a chain-like moiety, the chain-like moiety comprising a conjugated thiophene or phenyl group and comprising alkyl chains at ends of the chain-like moiety;

a gate electrode (12);

a source electrode (18); and

a drain electrode (20);

the source and drain electrodes being in spaced apart conductive contact with a channel portion of the semiconductor layer, the gate electrode being positioned to control a conductivity of the channel portion (see figures 1-2).

Regarding to claim 2, each of said moieties comprises on average at least about three conjugated aromatic rings (see col. 4, lines 1-23).

Regarding to claim 3, the alkyl chains comprise on average between about 3 and about 12 carbon atoms (see col. 4, lines 1-23).

Regarding to claim 8, in which each of said moieties comprises on average between about three and about six conjugated aromatic rings (see col. 4, lines 1-23).

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Regarding to claim 10, the channel portion has an on/off ratio of at least about 100 (see table, col. 7-8).

Regarding to claim 11, the semiconductor composition comprises a member selected from the group consisting of: 5,5'-Bis(4-n-hexylphenyl)-2,2'- bithiophene; 5,5'-Bis(4-a-hexylphenyl)-2,2":5',2"-terthiophene; 5,5'''-Bis(4-n-hexylphenyl)- 2,2':5',2":5" ,2'''-quaterthiophene; 1,4-Bis[5-(4-n-hexylphenyl)-2-thienyl]benzene; 2,5-Bis[4(4'-hexylphenyl)phenyl]thiophene; 5,5'''-Bis(4-n-hexyl)-2,2":5', 2':5",2'''-quaterthiophene; 5,5'''-Bis(4-n-hexyl)-2,2':5', 2"-5" 2'''":5'''",2'''"-pentathiophene; 1,4-Bis((5-n-hexyl)-2,2'-bithienyl]benzene; 2,6-bis(5-hexylthien-2-yl)naphthalene; and mixtures (see col. 4, lines 1-23).

Regarding to claim 19, polycrystalline semiconductor layer comprising an organic semiconductor composition, overlying and in contact with a portion of a surface having exposed aromatic groups (vaporizing (annealing) would form the polycrystalline film, see col. 5, lines 45-49).

Regarding to claim 22, an alkyl chain comprises, as a linkage in the chain, a member selected from the group consisting of oxygen, nitrogen or sulfur (see col. 4, lines 1-23).

Regarding to claim 23, an alkyl chain comprises a hetero substituent (see col. 4, lines 1-23).

Regarding to claim 24, a thiophene or phenyl group includes an alkyl- or hetero-substituent (see col. 4, lines 1-23).

Regarding to claim 25, each of the moieties comprises between about 3 and about 10 conjugated aromatic rings (see col. 4, lines 1-23).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 5-6, 9, 2-13, 21, 27 are stand rejected under 35 U.S.C. 103(a) as being unpatentable over Katz (U.S. Patent No. 6,403,397) as applied to claims 1-3, 7-8, 10-11, 19 above in view of Klauk et al., High-mobility polymer gate dielectric pentacene thin-film transistors, Journal of applied physics, November 1, 2002, pages 5259-5263, Vol. 92, Number 9 (cited by applicant), and Mushrush et al., Easily processable Phenylene-Thiophene-based organic field-effect transistors and solution-fabricated nonvolatile transistor memory elements, J. Am. Chem. Soc., 2003 pages 9414-9423, Vol. 125, Number 31 (cited by applicant), as previously.

Katz teaches forming a dielectric layer and forming a polycrystalline semiconductor on the dielectric layer. However, the reference does not teach dielectric layer is formed from a precursor composition of the group consisting of naphthalenes, styrenes, phenols, and cresols of poly(4-vinylphenol-co-2-hydroxyethyl methacrylate) which has a refractive index of at least about 1.52, the semiconductor composition comprises 5,5'-Bis(4-n-hexylphenyl)-2,2'-bithiophene and the specific crystal size, and mobility of the semiconductor layer.

Klauk et al. teaches a forming an organic thin-film transistor, wherein forming a dielectric layer by using poly(4-vinylphenol-co-2-hydroxyethyl methacrylate) (see page 5259).

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It is obvious that the same material would form a layer with a refractive index of at least about 1.52.

Therefore, it would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made would form a dielectric layer is formed from a precursor composition of the group consisting of naphthalenes, styrenes, phenols, and cresols of poly(4-vinylphenol-co-2-hydroxyethyl methacrylate) which has a refractive index of at least about 1.52 in process of Katz as taught by Klauk et al. because the process would form a device with large carrier mobility, low threshold voltage, low subthreshold swing, and large on/off current ratio (see page 5262).

Mushrush et al teach forming an organic field effect transistors wherein forming an organic semiconductor layer by using 5,5'-Bis(4-n-hexylphenyl)-2,2'-bithiophene (see abstract, page 9414 and 9416).

Therefore, it would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made would form an organic semiconductor layer by using 5,5'-Bis(4-n-hexylphenyl)-2,2'-bithiophene in process of Katz as taught by Mushrush et al. because the material would provide a transistor with high carrier mobility, low leakage current, straightforward synthesis, facile film deposition, and chemical stability.

It would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made to optimize the concentration of hydrogen within the dielectric layer, since it has been held that where the general conditions of a claim are disclosed in the prior art (i.e.- semiconductor crystal size of at least about 0.1 micrometer, polycrystalline semiconductor layer has a mobility of at least about 0.1 centimeters squared per volt-second), discovering the

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optimum or workable ranges involves only routine skill in the art. In re Aller, 105 USPQ 233 (CCPA 1955).

The specification contains no disclosure of either the critical nature of the claimed arrangement (i.e.- semiconductor crystal size of at least about 0.1 micrometer, polycrystalline semiconductor layer has a mobility of at least about 0.1 centimeters squared per volt-second) or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen limitations or upon another variable recited in a claim, the applicant must show that the chosen limitations are critical. In re Woodruff, 919 F.2d 1575, 1578 (FED. Cir. 1990).

Therefore, it would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made would forming the semiconductor layer with semiconductor crystal size of at least about 0.1 micrometer and a mobility of at least about 0.1 centimeters squared per volt-second in process of Katz in order to optimize the process.

Claims 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Katz (U.S. Patent No. 6,403,397) as applied to claims 1-3, 7-8, 10-11, 19 above in view of Katz et al., Synthesis, Solubility, and Field-Effect Mobility of Elongated and Oxa-Substituted a, w-Dialkyl Thiophene Oligomers, Extension of "Polar Intermediate" Synthetic Strategy and Solution Deposition on Transistor Substrates, Chem. Mater., 1998, Page(s) 633-638, Volume 10, number 2 (cited by applicant).

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Katz teaches forming a dielectric layer and forming a polycrystalline semiconductor on the dielectric layer. However, the reference does not teach dielectric layer has at least the polarizability of chlorobezene.

Katz et al. teaches dielectric layer has at least the polarizability of chlorobezene (see page 637).

Therefore, it would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made would form dielectric layer has at least the polarizability of chlorobezene in process of Katz as taught by Katz et al. because the material would provide a transistor with high carrier mobility, and chemical stability.

Response to Arguments

Applicant's arguments filed 7/10/06 have been fully considered but they are not persuasive.

Applicant contends that Katz does not teach the dielectric layer being formed from a precursor composition having a refractive index of at least about 1.52. In response to applicant Katz clearly teach a dielectric layer (14) comprising a surface, a portion of said surface having exposed aromatic groups (polyimide is aromatic polymer wherein the polyimide has a refractive index of at least 1.52, see col. 3, lines 15-19), (also, see paragraph# 28 of Nakai). It is also noted that polyimide is formed from organic precursor. With regard to the term "dielectric layer being formed from a precursor composition" is method recitations in a device claimed, and they are non-limiting, because only the final product is relevant, not the method of making. A product by

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process claim is directed to the product per se, no matter how actually made. See also MPEP 2113. Moreover, an old or obvious product produced by a new method is not a patentable product, whether claimed in "product by process" claims or not.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh Nguyen whose telephone number is (571) 272-1695, or by Email via address Thanh.Nguyen@uspto.gov. The examiner can normally be reached on Monday-Thursday from 6:00AM to 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, can be reached on (571) 272-1702. The fax phone number for this Group is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956 (**See MPEP 203.08**).



Thanh Nguyen
Patent Examiner
Patent Examining Group 2800

TTN